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SITE INVESTIGATION SITE CHARACTERIZATION FOR AEROSPACE MUSEUM SITE AND
GROUNDS MAINTENANCE YARD WORK PLAN WITH TRANSMITTAL LETTER NAS FORT
WORTH TX
9/1/1995
LAW ENGINEERING AND ENVIRONMENTAL



**NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS**

**ADMINISTRATIVE RECORD
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INSTALLATION RESTORATION PROGRAM (IRP)
SITE INVESTIGATION/SITE CHARACTERIZATION
FOR AEROSPACE MUSEUM SITE
AND GROUNDS MAINTENANCE YARD

WORK PLAN

Naval Air Station Fort Worth Joint Reserve Base, Carswell Field
Fort Worth, Texas

September 1995

Final



PREPARED FOR

AIR FORCE BASE CONVERSION AGENCY (AFBCA/OL-H)
NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE, CARSWELL FIELD
FORT WORTH, TEXAS 76127-5000

UNITED STATES AIR FORCE
AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE (AFCEE/ERB)
BROOKS AIR FORCE BASE, TEXAS 78235-5328

CONTRACT NO.: F41624-94-D-8050
DELIVERY ORDER 3209



LAW

ENGINEERING AND ENVIRONMENTAL SERVICES

September 11, 1995

Air Force Center for Environmental Excellence
HQ AFCEE/ERB
8001 Inner Circle Drive, Suite 2
Brooks Air Force Base, TX 78235-5328

Attention: Mr. Charles A. Rice (Team Chief)

Subject: **Final Work Plan**
Site Investigation/Site Characterization
Aerospace Museum Site and Grounds Maintenance Yard
Naval Air Station Fort Worth Joint Reserve Base, Carswell Field
Contract No. F41624-94-D-8050, Delivery Order No. 0009
Law Environmental Project No. 11-3517-3209

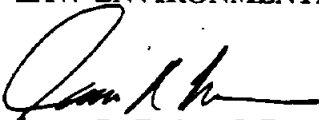
Dear Mr. Rice:


Law Environmental, Inc., is pleased to submit the enclosed four copies of the Site Investigation/Site Characterization Final Work Plan to the Air Force Center for Environmental Excellence (AFCEE). Scoping documents for the Fire Training Area No. 2 (FTA-2) investigation, included as part of this delivery order, will be submitted under separate cover as an addendum to these scoping documents.

If you have questions or comments, please contact us at (404) 499-6800.

Sincerely,

LAW ENVIRONMENTAL, INC.


James R. Forbes, P.E.
Project Manager


E. Fred Sharpe, Jr., P.E.
Principal

3517-3209.22

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INSTALLATION RESTORATION PROGRAM (IRP)
SITE INVESTIGATION/SITE CHARACTERIZATION
FOR
AEROSPACE MUSEUM SITE AND GROUNDS MAINTENANCE YARD

FINAL WORK PLAN
FOR
NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE, CARSWELL FIELD
FORT WORTH, TEXAS 76127-5000

SEPTEMBER 1995

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PURPOSE OF DOCUMENT

This Work Plan has been developed for the Naval Air Station Fort Worth Joint Reserve Base, Carswell Field. Procedures outlined in this plan are designed to describe the work to be performed, explain the project objectives, and present the rationale for conducting specific project activities. The plan will be effective upon final approval by the Air Force Center For Environmental Excellence (AFCEE).

Every effort will be made to fully comply with this plan. The success of the Installation Restoration Program depends on team effort and total dedication from the various parties involved. Therefore, efforts will be focused on achieving and maintaining compliance with this Work Plan and pertinent regulations.

The point of contact for this investigation is as follows:

Mr. Charles A. Rice, Team Chief
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8001 Inner Circle Drive, Suite 2
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Phone: (210) 536-6452

DISCLAIMER NOTICE

This Work Plan has been prepared for the United States Air Force by Law Environmental, Inc., for the purpose of aiding in the implementation of a final remedial action plan under the Air Force Installation Restoration Program (IRP). As the report relates to actual or possible releases of potentially hazardous substances, its release prior to an Air Force final decision on remedial action may be in the public's interest. The limited objectives of this Work Plan and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this Work Plan, because subsequent facts may become known which may make this Work Plan premature or inaccurate. Acceptance of this Work Plan in performance of the contract under which it is prepared does not mean that the United States Air Force adopts the conclusions, recommendations, or other views expressed herein, which are those of the contractor only and do not necessarily reflect the official position of the United States Air Force.

Government agencies and their contractors registered with the Defense Technical Information Center (DTIC) should direct their requests for copies of this Work Plan to:


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Cameron Station
Alexandria, VA 22304-6145

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National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161

PREFACE

Law Environmental, Inc., (LAW) was contracted by the U.S. Air Force Center For Environmental Excellence (AFCEE) to perform a site investigation/site characterization at two sites located at the Naval Air Station Fort Worth Joint Reserve Base, Carswell Field. The two sites to be investigated are the Aerospace Museum Site and the Grounds Maintenance Yard. The primary objective of this field investigation is to further characterize the condition of site soils. Project objectives will be achieved by installation of hand auger borings and collection of soil samples for laboratory analysis. This Work Plan summarizes the approach developed for this site investigation/site characterization project.



James R. Forbes, P.E.
Project Manager



E. Fred Sharpe, Jr., P.E.
Principal

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LIST OF ACRONYMS

AFBCA	Air Force Base Conversion Agency
AFCEE	Air Force Center for Environmental Excellence
ARARS	applicable or relevant and appropriate requirements
BRAC	base realignment and closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act (1980)
DEQPPM	Defense Environmental Quality Program Policy Memorandum
DOD	Department of Defense
DQOs	data quality objectives
ft	foot
ft ²	square feet
FSP	Field Sampling Plan
gpd	gallons per day
gpm	gallons per minute
HSP	Health and Safety Plan
IRP	Installation Restoration Program
IRPIMS	Installation Restoration Program Information Management System
ITIR	Informal Technical Information Report
LAW	Law Environmental, Inc.
LENL-P	Law Environmental National Laboratories - Pensacola, Florida
MTV	mobility, toxicity or volume
NAS FORT WORTH	Naval Air Station Fort Worth Joint Reserve Base, Carswell Field
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
OSHA	Occupational Safety and Health Administration
PARCC	precision, accuracy, representativeness, completeness, comparability
PCBs	polychlorinated biphenyls
PID	photoionization detector
POC	point of contact
PVC	polyvinyl chloride

LIST OF ACRONYMS
(Continued)

QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act (1986)
SPHEM	Superfund Public Health Evaluation Manual
SOW	Statement of Work
SVOCs	semi-volatile organic compounds
TC	Team Chief
TDSNFA	Technical Document to Support No Further Action
TNRCC	Texas Natural Resource Conservation Commission
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
VOCs	volatile organic compounds

1.0 INTRODUCTION

This Work Plan is provided in support of the United States Air Force (USAF) Installation Restoration Program (IRP) for the Site Investigation/Site Characterization of the Aerospace Museum Site and Grounds Maintenance Yard at the Naval Air Station Fort Worth Joint Reserve Base, Carswell Field (Figure 1-1). Solid waste management unit (SWMU) numbers have not been assigned to either the Aerospace Museum Site or the Grounds Maintenance Yard. However, both sites have been listed by the Texas Natural Resource Conservation Commission (TNRCC) as Areas of Concern.

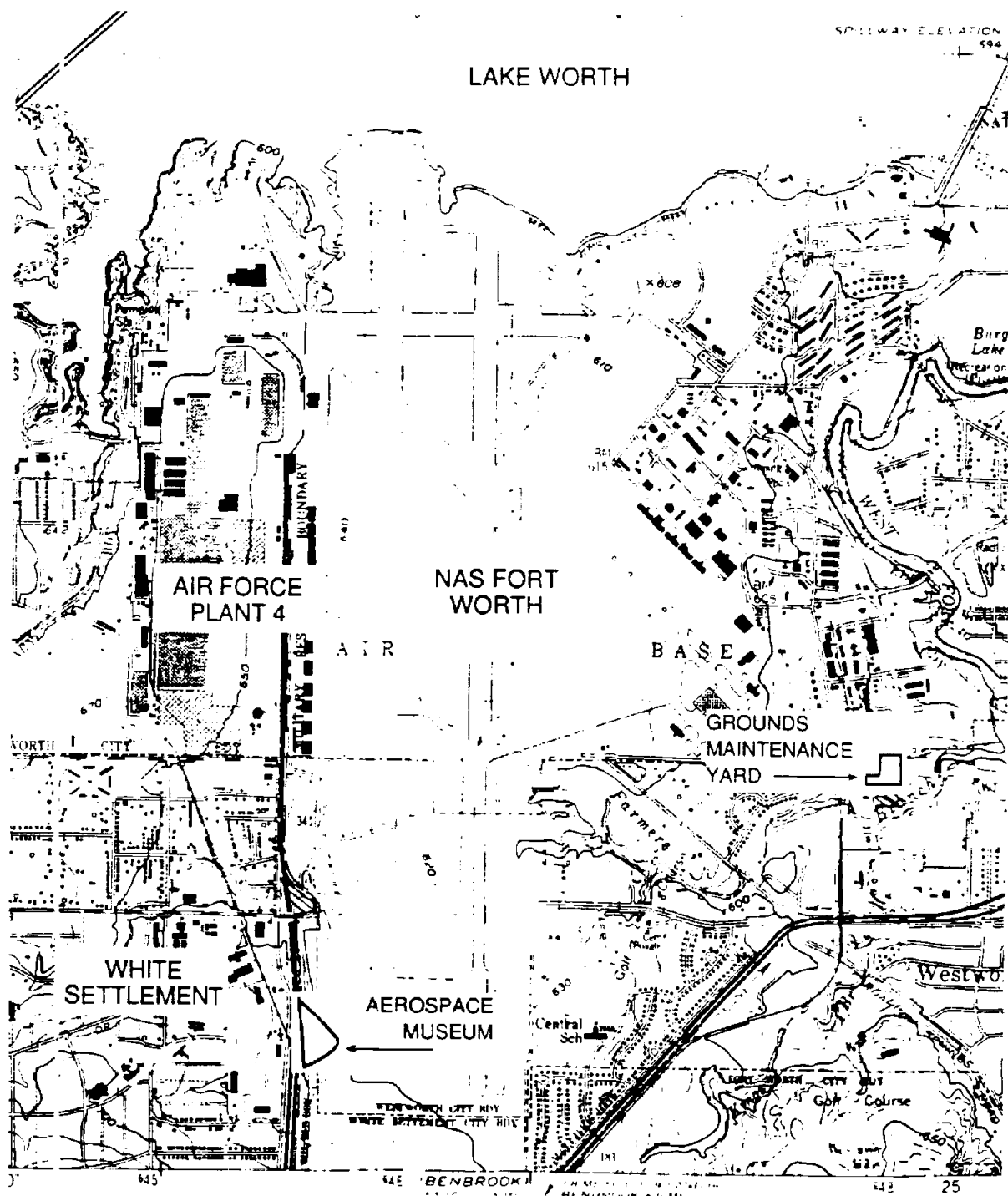
This investigation will be conducted in accordance with the Air Force Center for Environmental Excellence (AFCEE) Statement of Work (SOW) for Delivery Order 0009, dated August 19, 1994, and in accordance with the Law Environmental, Inc., (LAW) SOW interpretation letter, dated January 27, 1995 (LAW, 1995). The AFCEE Handbook (AFCEE, 1993) will be used as a source for supplemental guidance in developing the approach to this project.

1.1 DESCRIPTION OF THE AIR FORCE IRP

The USAF IRP is designed to identify, confirm/quantify, and remediate problems caused by past management of hazardous wastes at Air Force facilities. It is the basis for assessment and response actions at USAF installations, under the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA).

1.1.1 Brief History of the IRP Program

The USAF IRP is a Department of Defense (DOD) program for assessing and remediating hazardous waste problems at USAF installations. The IRP is designed to comply with CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the



UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

SITE INVESTIGATION/SITE CHARACTERIZATION

SITE VICINITY MAP

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CHECKED BY DATE	EFS / 04 AUG 95	1-1	02 AUG 95
PROJECT No	11-3517-3209		04 AUG 95
			FILE NAME
			3517-3209 01

Source: USGS Lake Worth, Texas Topographic Quadrangle, 1982
USGA Benbrook, Texas Topographic Quadrangle, 1981

recent Superfund Amendments and Reauthorization Act of 1986 (SARA). The program was formally designated as the DOD Superfund Program on November 21, 1981.

The current DOD IRP policy is contained in the Defense Environmental Quality Program Policy Memorandum (DEQPPM 81-5), which reissues, amplifies, and consolidates all previous directives and memoranda on the IRP. DOD policy is to identify and evaluate suspected problems associated with past hazardous material disposal sites, to control migration of hazardous contamination from Air Force facilities, and to minimize hazards to health or welfare that resulted from past operations.

The IRP takes further program definition from the following Executive Orders (EO):

- EO 12088, which directs the DOD to comply with substantive and procedural statutes
- EO 12316, which delegates responsibility for response actions at DOD sites to the Secretary of Defense
- EO 12580, which defines responsibilities of EPA and DOD under SARA for National Priority List (NPL) and non-NPL sites

1.1.2 Program Objectives

The objectives of the Air Force IRP are to assess past hazardous waste disposal and spill sites on Air Force installations and to develop remedial actions consistent with the NCP for those sites which pose a threat to human health and welfare or to the environment.

1.1.3 Program Organization

Prior to 1988, the basic USAF IRP comprised four phases:

- Phase I - Installation Assessment/Records Search. This phase identified past disposal sites that might pose a hazard to public health or the environment. It also determined those sites requiring further action, such as confirming an environmental hazard (Phase II). If a site required immediate remedial action, the program could proceed directly to Phase IV.
- Phase II - Confirmation/Quantification. This phase defined and quantified the extent of contamination, waste characteristics (when required by the regulatory agency), and sites or locations where remedial actions were required. Stage 1 of Phase II was an initial assessment to determine if contamination was present at a site. Sites found to be contaminated might require further investigation in subsequent stages of Phase II to assess the extent and significance of contamination. Sites warranting immediate remedial action could be transferred to Phase IV. Research requirements identified during Phase II were included in the Phase III effort of the program.
- Phase III - Technology-Based Development. This phase developed new technologies for treating pollutants which have no currently available, or economically feasible, treatment. This phase included implementation of research requirements and technology development. A Phase III requirement could be identified at any time during the program.
- Phase IV - Remedial Action. This phase involved the preparation and implementation of the remedial action plan.

In 1988, the phased approach of the IRP was superseded by an approach more closely approximating the remedial investigation and feasibility study (RI/FS) format used by the United States Environmental Protection Agency (USEPA). The new IRP format combines the Phase II Confirmation/Quantification Study and the

Phase IV Remedial Action Plan as outlined under the older version of the IRP to efficiently arrive at appropriate remedial actions in a timely manner.

Potential sites of concern are first identified through a preliminary assessment, including a literature/records search. If a release is suspected, an initial sampling and analytical program is recommended to identify target contaminants and confirm their presence. When a preliminary assessment has been completed, either an RI/FS program is recommended to further evaluate the sites, or a Technical Document to Support No Further Action (TDSNFA) is prepared.

A remedial investigation is conducted in stages to collect information on the type and extent of contamination in the environment through field sampling. The results are evaluated in terms of public health and environmental criteria. A feasibility study, in which remedial alternatives are identified and ultimately recommended for selection, is conducted concurrently with the remedial investigation so that field data needed to select a remedy are collected during the field investigation.

The RI/FS is intended to systematically:

- Identify and prioritize contamination sources with respect to hazard
- Determine the nature and extent of contamination, or conclude that no significant adverse impact exists
- Determine the pathways and risks of the identified contamination to various human and environmental receptors
- Plan and conduct field activities that will support the selection and eventual design of appropriate remedial actions
- Develop appropriate remedial alternatives

The RI/FS program involves a preliminary sampling and analysis effort leading to the development of alternatives. If necessary, a more detailed sampling and analytical effort will be conducted to delineate contamination and quantify pathways to aid in the selection of alternatives. The RI/FS encompasses several key elements necessary to select an appropriate remedial action. These include:

- Determination of the federal and state applicable or relevant and appropriate requirements (ARARs)
- Development of the data quality objectives (DQOs) consistent with the ARARs and achievable with acceptable field and analytical procedures
- Performance of a field investigation in one or more stages to collect sufficient information to assess contamination movement and pathways and to support development of potential alternatives, as described in CERCLA and NCP as the RI
- Determination of the hazards by quantitatively determining the impact on receptors through the pathways of surface water, ground water, biota, and air; incorporating the exposure and risk assessment as required under CERCLA, NCP, and SARA, and as defined in the Superfund Public Health Evaluation Manual (SPHEM)
- Determination of those sites where the results of the field investigation and risk assessment indicate no significant threat to human health or welfare, or to the environment, and preparation of a decision document identifying any necessary control measures or no need for further action
- Development of a set of potential alternatives, consisting of appropriate technologies that can remove the contamination or control its migration; provide a range of reduction of the mobility, toxicity, or volume (MTV) associated with the contamination; and meet or exceed the ARARs

Initial screening of alternatives is conducted using criteria of effectiveness, implementability, and cost. If necessary, additional studies are performed to support selection of technologies. A detailed analysis is then conducted to evaluate

alternatives using a set of criteria that includes protectiveness, compliance with ARARs, reduction of MTV, schedule, reliability, capital, and operation and maintenance costs.

After a remedial alternative is selected, a Record of Decision (ROD) is created, which documents the selection based on information and recommendations contained in the IRP RI/FS reports. If an engineering solution is selected, the remedial design is specified then implemented.

1.2 SITE-SPECIFIC IRP WORK

The following sections include the installation description, previous IRP investigation activities at the Aerospace Museum Site and Grounds Maintenance Yard, and remedial action at the two sites.

1.2.1 Installation Description

The installation is located in northeastern Texas in Tarrant County, 6 miles west of downtown Fort Worth (Figure 1-1). It is bordered by Lake Worth to the north, the West Fork of the Trinity River and the community of Westworth to the east and southeast, the community of White Settlement to the south and southwest, and Air Force Plant No. 4 to the west.

1.2.2 Previous Investigative Activities and Documentation

An Environmental Baseline Survey (NAS Fort Worth, 1993) was conducted by the Air Force Base Conversion Agency (AFBCA) in 1993, which documented the presence of debris, surface soil stains, and decommissioned aircraft in various stages of repair at the Aerospace Museum Site. There is no other written documentation concerning the Aerospace Museum Site or the Grounds Maintenance Yard.

1.2.3 Existing Remedial Actions

There are no existing remedial actions being conducted at either the Aerospace Museum Site or the Grounds Maintenance Yard.

1.3 DESCRIPTION OF CURRENT STUDY

This section describes project objectives, scoping documents, and the role of subcontractors.

1.3.1 Project Objectives

The primary project objectives of the site investigation/site characterization portion of Delivery Order 0009 are to provide initial site characterization of the Aerospace Museum Site and Grounds Maintenance Yard by determining the presence or absence of contamination in surface soils resulting from previous site activities. Site-specific objectives for each study site are presented in Section 3.0.

1.3.2 Scoping Documents

Documents being prepared for this effort include:

- Work Plan (this document)
- Sampling and Analysis Plan (LAW, 1995a)
- Health and Safety Plan Addendum (LAW, 1995b)

1.3.2.1 Work Plan - Preparation of the Work Plan for the Aerospace Museum Site and Grounds Maintenance Yard investigation/site characterization effort has been based on findings and recommendations in part from past investigations and also from observations of potential environmental concerns at NAS Fort Worth. The Work Plan details recommendations and the decision rationale for conducting field investigations and includes the DQOs. The

format for this Work Plan is based on the AFCEE Handbook to Support the Installation Restoration Program Statements of Work for Remedial Investigations and Feasibility Studies (AFCEE, 1993).

1.3.2.2 Sampling and Analysis Plan - A Sampling and Analysis Plan (SAP) has also been developed as a companion document to the Work Plan. The SAP consists of two parts, the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP). The QAPP describes the policy, organization, functional activities, and quality assurance/quality control (QA/QC) procedures which will be implemented in order to achieve the DQOs dictated by the intended use of the data. The FSP provides guidance for all field activities and defines, in detail, the sampling and data gathering methods to be used during the investigation.

1.3.2.3 Health and Safety Plan - A Health and Safety Plan (HSP) addendum has been prepared to comply with the Occupational Safety and Health Administration (OSHA) health and safety regulations regarding the work effort detailed in the Work Plan. The HSP uses OSHA guidelines for designating the appropriate level of protection needed at the study sites.

1.3.3 Identity of Subcontractors and Their Roles

LAW will manage the project and provide services related to field sampling, data analysis, site characterization, and reporting.

Law Environmental National Laboratories-Pensacola, Florida, (LENL-P) has been subcontracted to perform soil chemical analyses. Details of project organization, personnel, and subcontractor responsibility are provided in the QAPP.

2.0 SUMMARY OF EXISTING INFORMATION

The following discussion of the environmental setting at the Naval Air Station Fort Worth Joint Reserve Base, Carswell Field (NAS Fort Worth) is derived primarily from the Installation Restoration (IRP) Program Phase I Records Search Report (CH2M Hill, 1984). Information from that report is supplemented by information from the literature and from the general findings of studies conducted by the U.S. Army Corps of Engineers (USACE, 1991) and Radian Corporation (Radian, 1986; 1991a).

2.1 ENVIRONMENTAL SETTING

The majority of the installation is located within the Grand Prairie section of the Central Lowlands Physiographic Province. This area is characterized by broad terraces sloping gently to the east, divided by westward-facing escarpments. The land is typically grass covered and treeless, except for isolated stands of upland timber. The northwestern portion is within the Western Cross Timbers Physiographic Province, which is characterized by rolling topography and a heavy growth of post and black-jack oaks (USACE, 1991).

2.1.1 Contaminant Sources and Contamination

Based on review of available information, primary contaminant sources at the Aerospace Museum Site and Grounds Maintenance Yard were from intermittent surface spills of petroleum-related products and solvents, which also contained metals contamination. Intermittent spills of pesticides are suspected to have occurred at the Grounds Maintenance Yard because handling of pesticides is part of the grounds maintenance operation.

2.1.2 Geology

The majority of the base is covered by Quaternary terrace deposits of the Trinity River. The terrace deposits are composed of sands, silts, clays, and gravels of variable thickness and lateral extent. These deposits are underlain by Cretaceous limestones. The uppermost limestone formation in the southeastern portion of the base is the Goodland Formation. The Goodland Formation is a chalky white fossiliferous limestone and marl. The Goodland Formation outcrops approximately 200 feet east of the 1337 Storage Yard in Farmers Branch. Beneath the Goodland Formation is the Walnut Formation, a coquincoidal limestone with variable quantities of clay and shale. Underlying the Walnut Formation is the Paluxy Formation, a fine-to-coarse grain sand with minor quantities of clay, sandy clay, pyrite, lignite, and shale. The regional dip of the rocks in the vicinity ranges from 35 to 40 feet per mile to the east and southeast.

2.1.3 Ground Water

Five hydrogeologic units have been identified at NAS Fort Worth. These five units, listed from most shallow to deepest, are as follows:

- An upper perched-water zone occupying the alluvial terrace deposits of the Trinity River
- An aquitard consisting of predominantly unsaturated limestone of the Goodland and Walnut Formations
- The Paluxy sand
- An aquitard of relatively impermeable limestone in the Glen Rose Formation
- A major aquifer in the sandstone of the Twin Mountains Formation

Upper Zone - Perched ground water occurs as lenses within the coarse alluvial sand and gravel deposits along the Trinity River. These lenses are limited in lateral extent and are surrounded by low-permeability clays and silts. Ground water in the upper zone occurs at depths ranging from 7 to 13 feet. Annual ground-water table fluctuations are typically on the order of 5 feet (USGS, 1993). Recharge to the water-bearing deposits is from rainfall and infiltration in stream channels and drainage ditches. Water flow in the alluvium is basically eastward, toward the West Fork of the Trinity River (USACE, 1991).

In parts of Tarrant County near the Trinity River, the upper zone is developed for irrigation and residential use. The community of River Oaks, immediately east of NAS Fort Worth formerly utilized supply wells developed in alluvial deposits at a location near the base hospital. The wells were abandoned when NAS Fort Worth purchased the property for hospital construction. In general, ground water in the upper zone is not economical to develop due to the zone's limited distribution and susceptibility to surface-water/storm-water pollution (USACE, 1991).

The Quaternary terrace deposits that form the perched-water zone are composed of sand, silt, clay, and gravel. Ground water is first encountered within the perched-water zone at depths ranging from approximately 5 to 15 feet below the ground surface. Annual ground-water fluctuations are typically on the order of 5 feet. Recharge to the perched-water zone is from rainfall and infiltration from stream channels and drainage ditches.

Goodland/Walnut Aquitard - The perched water present in the alluvium is separated from the underlying aquifers by the low permeability limestone and shale of the Goodland Limestone and Walnut Formation. The aquitard consists of moist clay and shale layers interbedded with dry limestone beds. Though primarily dry, drillers in the area have reported small amounts of water in the

Walnut Formation, suggesting that ground water may move through the Walnut Formation along bedding planes. The thickness of the Goodland/Walnut aquitard is approximately 25 feet or greater beneath most of NAS Fort Worth. However, the top of the aquitard is an erosional surface, and weathering may have locally reduced the thickness of the limestone. In a soil boring at Air Force Plant No. 4, immediately west of NAS Fort Worth, the Goodland Limestone had been completely eroded and only 3 feet of the Walnut Formation was present. It is also reported that the upper zone and Paluxy formation are in contact at the eastern boundary of Plant No. 4, where both the Goodland and Walnut formations have been removed by erosion. In areas of similar erosion, water in the upper zone could come in contact with water in the Paluxy aquifer (USACE, 1991).

Paluxy Aquifer - The Paluxy aquifer is the shallowest bedrock aquifer beneath NAS Fort Worth. Water in the Paluxy normally occurs under confined conditions beneath the Goodland/Walnut aquitard except where the aquitard is absent due to erosion. Ground water is typically encountered at a depth of approximately 100 feet below ground surface (450 feet above mean sea level elevation) along the eastern portion of NAS Fort Worth. Extensive pumping in the Fort Worth area has lowered the Paluxy potentiometric surface below the top of the formation, resulting in unconfined conditions beneath the installation. The Paluxy Formation is divided into upper and lower sand members and the aquifer is likewise divided into upper and lower aquifers. The upper sand is fine-grained and shaley while the lower sand is coarser; therefore, most wells are completed in the lower section (USACE, 1991).

The Paluxy aquifer is recharged along outcrops west of NAS Fort Worth. Paluxy outcroppings also occur north of the base in the bed of Lake Worth. The lake bed represents a significant recharge source for the aquifer and creates a localized potentiometric high.

Regional ground-water flow within the Paluxy is eastward, parallel with regional dip. Ground-water flow at NAS Fort Worth is influenced by the Lake Worth potentiometric high and by a potentiometric low induced by ground-water withdrawals of the community of White Settlement. This produces a generally southeasterly flow direction (USACE, 1991).

Transmissivities in the Paluxy aquifer range from 1,263 to 13,808 gallons per day per foot (gpd/ft) and average 3,700 gpd/ft. In Tarrant County, the Paluxy Formation ranges in thickness from 140 to 190 feet, averaging 160 feet. The actual water-bearing thickness in the NAS Fort Worth area probably approximates the formation thickness, but the aquifer is separated into two distinct water-bearing zones. In the vicinity of NAS Fort Worth, permeabilities range from 13 to 140 gpd/ft² (based on an approximate thickness for the aquifer of 100 feet) Well yields from the Paluxy aquifer range from 10 to 480 gallons per minute (gpm) averaging approximately 100 gpm (USACE, 1991).

The Paluxy aquifer represents a significant source of potable ground water in the Fort Worth area. Communities adjacent to NAS Fort Worth, especially White Settlement, develop municipal water supplies from the Paluxy, as well as from the deeper Twin Mountains aquifer. As a result of extensive pumping, water levels in the Paluxy aquifer have declined significantly over the years. Water levels in the immediate NAS Fort Worth vicinity have not lowered to the same degree as in the Fort Worth area because the base does not produce water from the Paluxy (USACE, 1991).

Glen Rose Aquitard - Below the Paluxy Aquifer are the fine-grained limestone, shale, marl, and sandstone beds of the Glen Rose Formation. The thickness of the formation varies from 250 to 450 feet. Although the sands in the Glen Rose Formation yield small supplies to wells in Fort Worth and western Tarrant County,

the relatively impermeable limestone behaves as an aquitard, restricting water movement between the overlying Paluxy aquifer and the underlying Twin Mountains aquifer (USACE, 1991).

Twin Mountains Aquifer - The Twin Mountains Formation is the oldest formation used for water supply in the NAS Fort Worth area. The formation consists of a basal conglomerate of chert and quartz, grading upward into coarse-to-fine grain sand interbedded with shale. The formation varies in thickness from 250 to 430 feet. The Twin Mountains aquifer is recharged along outcrops west of NAS Fort Worth. Water movement is eastward in the direction of regional dip. Like water in the Paluxy aquifer, the Twin Mountains aquifer occurs under unconfined conditions in the recharge area, becoming progressively more confined in the downdip direction (USACE, 1991).

The Twin Mountains aquifer is the principal aquifer in Tarrant County and yields large water supplies for municipal (including human consumptive) and industrial purposes. In Tarrant County, transmissivities in the Twin Mountains aquifer range from 1,950 to 29,700 gpd/ft averaging 8,450 gpd/ft. Permeabilities range from 8 to 165 gpd/ft² averaging 68 gpd/ft² (USACE, 1991).

Ground-water withdrawals from the Twin Mountains aquifer, primarily for municipal water supply, have resulted in declining water levels. Between 1955 and 1976, the potentiometric surface of the aquifer dropped approximately 250 feet. Water quality in the Twin Mountains aquifer is suitable for potable use throughout the Fort Worth area (USACE, 1991).

2.1.4 Surface Water

NAS Fort Worth is located within the Trinity River Basin immediately south of Lake Worth, a man-made reservoir on the Trinity River. A portion of the installation is drained by Farmer's Branch, which, discharges into the West Fork of the

Trinity River just south of the cantonment area. Farmer's Branch begins with the community of White Settlement and flows eastward. Immediately south of Air Force Plant No. 4, Farmer's Branch flows under the runway through two large culverts (USACE, 1991).

Most of the installation's surface drainage is diverted through a series of storm drains and culverts. The water is in turn directed to oil/water separators and discharged to the West Fork downstream of Lake Worth. A small portion of the north end of the installation drains directly into Lake Worth.

2.1.5 Climatology/Air

NAS Fort Worth is located in north central Texas at approximately 33 degrees north latitude. The climate is humid subtropical with hot summers and dry winters. Tropical maritime air masses control the weather during much of the year; however, the passage of polar cold fronts and continental air masses create large variations in winter temperatures (USACE, 1991).

The average annual temperature for NAS Fort Worth is 65 degrees Fahrenheit and monthly mean temperatures vary from 45 degrees Fahrenheit in January to 86 degrees Fahrenheit in July (Table 2-1). The average daily minimum temperature in January is 35 degrees Fahrenheit, and the lowest recorded temperature is 2 degrees Fahrenheit. The average daily maximum temperature in July and August is 95 degrees Fahrenheit, and the highest temperature recorded at the base was 111 degrees Fahrenheit in the month of June. Freezing temperatures occur at NAS Fort Worth an average of 33 days per year (USACE, 1991).

Mean annual precipitation recorded at NAS Fort Worth is 32 inches. The wettest month is May, with a secondary maximum in September. The period from November to March is generally dry with a secondary

TABLE 2-1

METEOROLOGICAL DATA SUMMARY
NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE, CARSWELL FIELD
Fort Worth, Texas

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
TEMPERATURE (°F)													
Mean	45	50	57	66	74	82	86	85	78	68	56	49	68
Average Daily Maximum	55	60	67	76	83	91	95	95	88	78	66	59	76
Average Daily Minimum	35	39	46	56	64	72	75	75	68	57	46	38	56
Highest Recorded	88	88	85	89	100	111	109	110	107	105	89	91	110
Lowest Recorded	2	6	11	31	42	55	61	60	46	33	17	11	2
PRECIPITATION (inches)													
Mean	1.7	1.9	2.1	3.9	4.2	3.1	2.5	2.1	3.6	3.1	1.8	1.9	31.9
Maximum Monthly	5.9	4.7	6.5	14.2	15.2	8.8	9.0	6.0	9.6	10.7	7.4	6.7	15.2
Minimum Monthly	0.1	0.1	(a)	0.8	0.8	0.1	(a)	(a)	(a)	(a)	(a)	(a)	(a)
Maximum in 24 hours	2.8	3.2	3.4	3.3	5.7	3.5	5.9	3.1	4.0	3.2	2.8	2.9	5.9
Days with Thunderstorms	1	2	3	6	8	6	5	5	4	3	1	1	45
SNOWFALL (inches)													
Mean	2	1	6	0	0	0	0	0	0	0	(b)	(b)	3
Maximum Monthly	8	12	7	0	0	0	0	0	0	0	4	3	8
Maximum in 24 hours	5	8	7	0	0	0	0	0	0	0	4	3	8
RELATIVE HUMIDITY (%)													
Mean	62	61	61	64	68	64	58	60	65	65	63	62	63
SURFACE WINDS (knots)													
Mean	8	8	9	9	7	8	6	5	6	6	8	8	7
Maximum	50	63	69	64	68	65	56	54	80	45	54	58	80
Prevailing Direction	S	S	S	S	S	S	S	S	S	S	S	S	S

Source: United States Air Force, Carswell AFB, Texas. Period of Record: 1946-1978.

(a) = Less than one tenth inch.

(b) = Less than 1 inch.

3517-3209.22

minimum in August. Snowfall accounts for a small percentage of the total precipitation between November and March, with an average measurable snowfall of two days per year. Lake evaporation at NAS Fort Worth is estimated to be approximately 57 inches per year. Evapotranspiration over land areas may be greater or less than lake evaporation depending on vegetative cover type and moisture availability. Average net precipitation is expected to be equal to the difference between average total precipitation and average lake evaporation, or approximately minus 25 inches per year (USACE, 1991).

Thunderstorm activity occurs at NAS Fort Worth an average of 45 days per year. The greatest number of these storms occur between April and June. Hail may fall two to three days per year. The maximum precipitation recorded in a 24-hour period is 5.9 inches (USACE, 1991).

Mean cloud cover averages 50 percent at NAS Fort Worth with clear weather occurring frequently during all months. Some fog is present, on an average of 83 days per year. Wind speed averages 7 knots; however, a maximum of 80 knots has been recorded. Wind direction is predominately from the south during all months (USACE, 1991).

2.1.6 Biology

There are no endangered species associated with either the Aerospace Museum Site or Grounds Maintenance Yard.

2.1.7 Demographics

2.1.7.1 Population Data - The total work force at NAS Fort Worth was approximately 6,100 persons, which included about 1,000 civilian personnel (USACE, 1991). Future demographics of NAS Fort

Worth will be determined by the Final Base Realignment and Closure (BRAC) Policies.

The city of Fort Worth was estimated to have a population of 414,562 in 1984, with a population density of 1,617 people per square mile. The smaller suburbs of Fort Worth adjacent to NAS Fort Worth had 1980 population data as follows (USACE, 1991):

- White Settlement - 13,508
- Westworth - 3,651
- River Oaks - 6,890

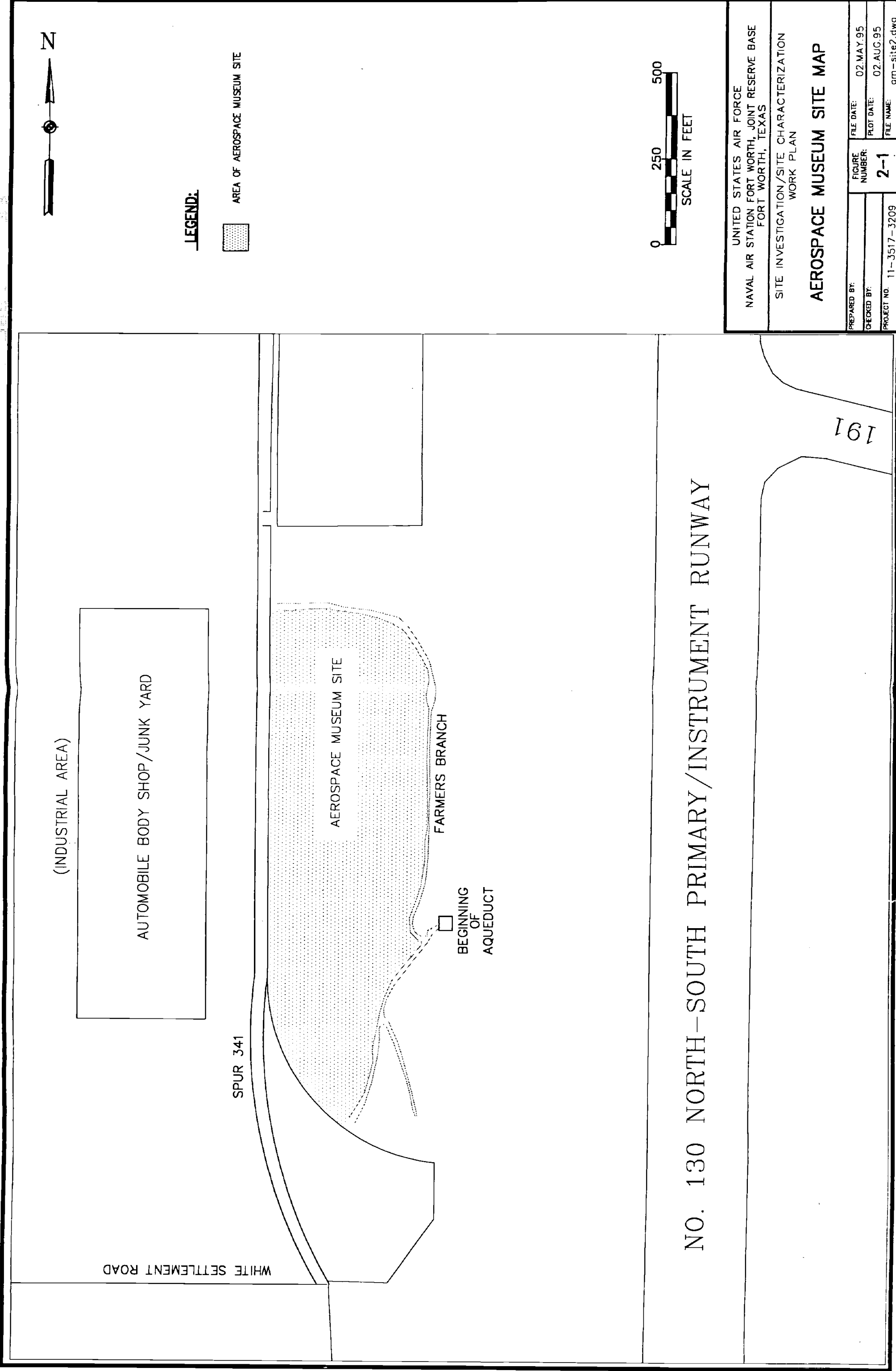
2.1.7.2 Land Use - The base is surrounded by residential, commercial, recreational, and industrial land. Residential land use is to the southwest, southeast and east of the installation. Commercial property is located to the south, while recreational property (Lake Worth) is north of the installation. Air Force Plant No. 4 is the industrial facility directly west of NAS Fort Worth (USACE, 1991).

2.2 SITE-SPECIFIC ENVIRONMENTAL SETTING

The following paragraphs describe the environmental setting associated with the Aerospace Museum and Grounds Maintenance Yard Sites.

2.2.1 Aerospace Museum Site

The Aerospace Museum Site is located along Spur 341, the western portion of NAS Fort Worth, south of Air Force Plant No. 4 (AFP-4) (Figure 2-1). This 12.5-acre museum site has been used for display of various aircraft, vehicles, and storage equipment. A records search indicated that an asphalt batching plant was previously located at the site. Also, a B-52 bomber was previously stored and dismantled at the site, resulting in small chips of aircraft skin



LEGEND:



AREA OF AEROSPACE MUSEUM SITE



UNITED STATES AIR FORCE			
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE			
FORT WORTH, TEXAS			
SITE INVESTIGATION/SITE CHARACTERIZATION		WORK PLAN	
AEROSPACE MUSEUM SITE MAP			
PREPARED BY:	FIGURE NUMBER:	FILE DATE:	02.MAY.95
CHECKED BY:	2-1	PLOT DATE:	02.AUG.95
PROJECT NO. 11-3517-3209		FILE NAME:	am-site2.dwg

being buried in the surface soil. NAS Fort Worth personnel conducted a site survey on April 9, 1993, and reported the following:

- Several spots of stressed vegetation and dark oily spots near aircraft and ground vehicle displays
- Stressed vegetation along the west fence line and randomly throughout the aircraft display area
- A 55-gallon drum of material assumed to be waste grease
- Discarded paint cans
- A 55-gallon drum of cleaning compound
- Several rusted and unidentifiable cans and drums (NAS Fort Worth, 1993)

In October 1994, LAW and AFCEE representatives met at NAS Fort Worth to visit the Aerospace Museum Site and found that the debris listed above had been removed, and neither surface staining nor stressed vegetation were evident.

2.2.2 Grounds Maintenance Yard

The Grounds Maintenance Yard is located east of the main gate, between Rogner Drive and Farmers Branch (Figure 2-2). The Grounds Maintenance Yard is a graveled yard with two small maintenance buildings, a pesticide storage shed, and two 500-gallon aboveground gasoline storage tanks. A site walk-through survey conducted by LAW and AFCEE personnel found some soil staining and areas suspected to have formerly contained chemical storage sheds and/or petroleum storage tanks.

2.3 CONCEPTUAL SITE MODEL

Not used.

PREPARED BY: JLT 9/10/95	FIGURE NUMBER: 2-2	FILE DATE: 03.MAY.95
CHECKED BY: JLT 9/10/95		PLOT DATE: 05.SEP.95
PROJECT NO. 11-3517-3209		FILE NAME: gmy-map2.dwg

2.4 REMEDIAL ACTION

Not used.

2.5 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Not used.

2.6 DATA NEEDS

Not used.

3.0 FIELD SAMPLING

This section describes the project objectives for the Aerospace Museum Site and Grounds Maintenance Yard. Field investigation activities, the literature search, record keeping procedures, and data assessment and background characterization procedures are also discussed.

3.1 SITE OBJECTIVES

Project objectives will be accomplished through the collection of environmental samples, the laboratory analyses of these samples, the evaluation of the analytical results and field measurements with respect to quality control data, and the interpretation and evaluation of all data collected.

3.1.1 Site Objective for Aerospace Museum Site

The project objective is to conduct an initial site characterization to determine the presence or absence of contamination in surface soils resulting from previous site activities, which included the storage and restoration of surplus aircraft for use as museum pieces. Potential contaminants include lubricants, solvents, and aircraft paint. The site is not included in the Resource Conservation and Recovery Act (RCRA) Part B permit dated February 1991.

3.1.2 Site Objective for Grounds Maintenance Yard

The project objective is to conduct an initial site characterization to determine the presence or absence of contamination in surface soils resulting from past operations, which included storage and maintenance of groundskeeping equipment, and storage of pesticides, solvents, and fuels. Potential

contaminants include lubricants, solvents, and pesticides. The site is not included in the RCRA Part B permit dated February 1991.

3.2 FIELD INVESTIGATION

The field investigation activities for each site are described below.

3.2.1 Field Sampling - Aerospace Museum Site

Initially, a soil sampling grid will be constructed with sampling locations positioned at 100-foot intervals (Figure 3-1). Two of the grid locations were selected by AFCEE to be omitted in lieu of background samples. The two background sample locations will be determined in the field. Based on the configuration of the site, approximately 47 sample locations will be located within the grid. Sampling locations may be offset where obvious soil staining is observed, at source areas identified during the field efforts, or at locations with accumulations of aircraft debris. At each sampling location, a surficial soil sample will be collected from the 0- to 2-foot interval. The soil samples will be collected using stainless steel hand augers.

The soil samples and the appropriate QA/QC samples will be stored on ice and transported under chain-of-custody protocol to Law Environmental National Laboratories in Pensacola, Florida. The soil samples will be analyzed for volatile organic compounds (VOCs) by EPA Method 8240, semi-volatile organic compounds (SVOCs) by EPA Method 8270, and metals by EPA Methods 6010/7000. Refer to Section 2.2.1.1 of the Sampling and Analysis Plan for details for surface soil sampling procedures and to Section 1.8 for laboratory analytical procedures.

(INDUSTRIAL AREA)

AUTOMOBILE BODY SHOP/JUNK YARD

WHITE SETTLEMENT ROAD

SPUR 341

BEGINNING
OF
AQUEDUCT

AEROSPACE MUSEUM SITE

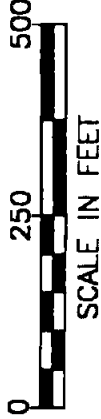
NO. 130 NORTH--SOUTH PRIMARY/INSTRUMENT RUNWAY

191



LEGEND:

- PROPOSED SURFACE SOIL LOCATION (SAMPLE LOCATION BASED ON 100 FT. GRID)



UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

SITE INVESTIGATION/SITE CHARACTERIZATION
WORK PLAN

AEROSPACE MUSEUM SITE
PROPOSED SAMPLE LOCATIONS

PREPARED BY: *SHF 7SEP 95*
CHECKED BY: *SBR 7SEP 95*
PROJECT NO. 11-3517-3209

FIGURE
NUMBER:
3-1

FILE DATE: 03.MAY.95
PLOT DATE: 05.SEP.T.95
FILE NAME: atm-somp3.dwg

3.2.2 Field Sampling - Grounds Maintenance Yard

Initially, a soil sampling grid will be constructed with sampling locations positioned at 60-foot intervals (Figure 3-2). Two of the grid locations were selected by AFCEE to be omitted in lieu of background samples. The two background sample locations will be determined in the field. Based on the configuration of the site, approximately 28 sample locations will be located within the grid. Soil sampling locations may be offset in stained areas near the two maintenance buildings, the location of the former pesticide storage building, the location of the former petroleum storage tanks, and at locations where obvious soil staining is observed. At each sampling location, a surficial soil sample will be collected from the 0- to 2-foot interval. The soil samples will be collected using stainless steel hand augers.

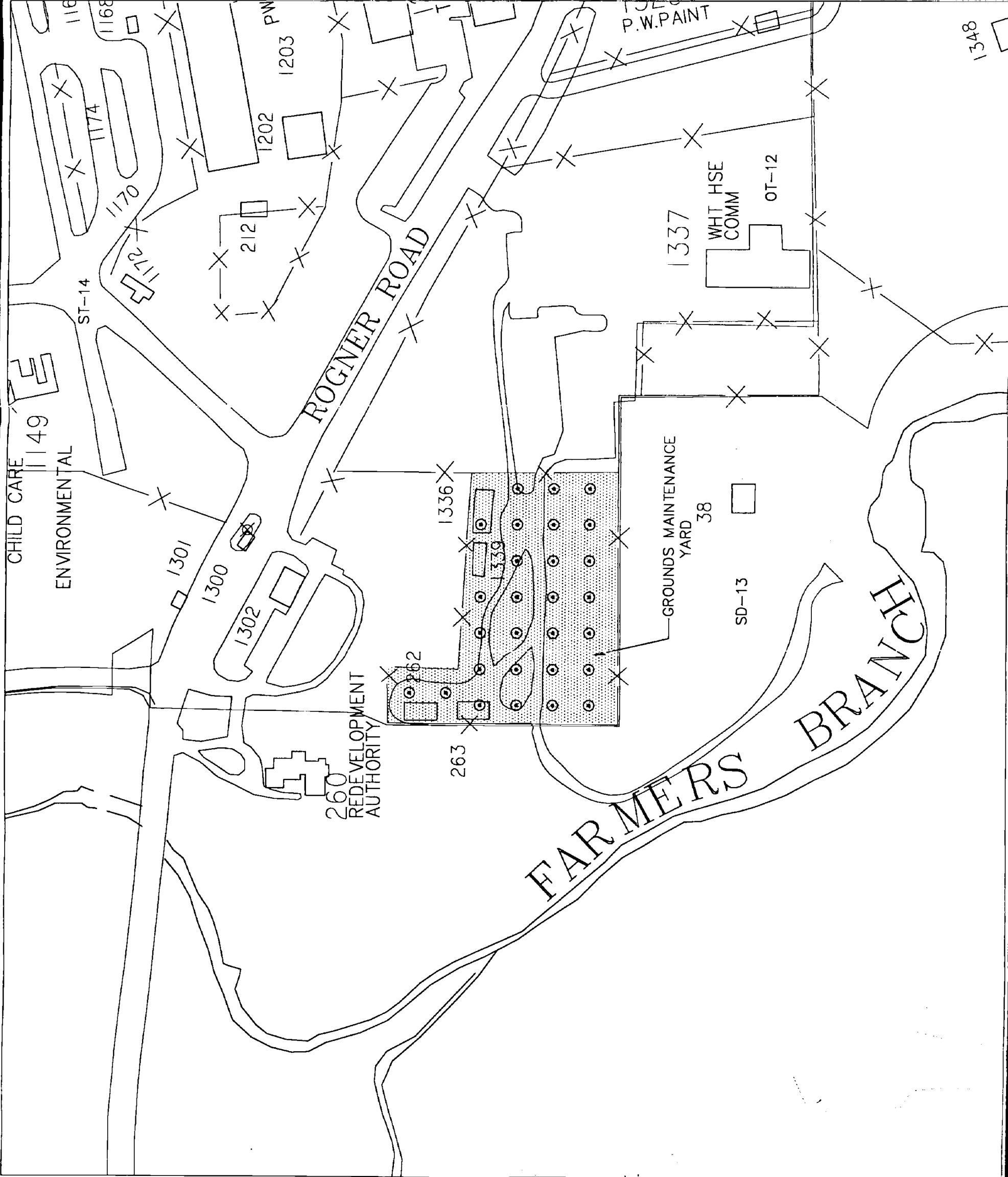
The soil samples and the appropriate QA/QC samples will be stored on ice and transported under chain-of-custody protocol to Law Environmental National Laboratories in Pensacola, Florida. The soil samples will be analyzed for VOCs by EPA Method 8240, SVOCs by EPA Method 8270, pesticides polychlorinated biphenyls (PCBs) by EPA Method 8080, metals by EPA Methods 6010/7000, and herbicides by EPA Method 8150. Refer to Section 2.2.1.1 of the Sampling and Analysis Plan for detailed surface soil sampling procedures and to Section 1.8 for laboratory analytical procedures.

3.2.1.3 Aquifer Testing - Not used.

3.2.1.4 Geophysical Surveys - Not used.

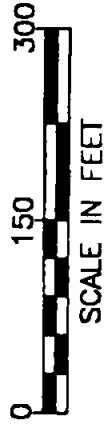
3.2.2 Sampling and Analysis Activities

Sampling and analysis activities are described in the Sampling and Analysis Plan (LAW, 1995a) for this project.



LEGEND:

- PROPOSED SURFACE SOIL LOCATION (SAMPLE LOCATION BASED ON 60 FT. GRID)



UNITED STATES AIR FORCE
NAVAL AIR STATION FORT WORTH, JOINT RESERVE BASE
FORT WORTH, TEXAS

SITE INVESTIGATION/SITE CHARACTERIZATION
WORK PLAN

**GROUND'S MAINTENANCE YARD
PROPOSED SAMPLE LOCATIONS**

PREPARED BY: <i>WLT 11Apr95</i>	FIGURE NUMBER:	FILE DATE: 03.MAY.95
CHECKED BY: <i>SL 15Sep95</i>	3-2	PLOT DATE: 05.SEP.T.95
PROJECT NO. 11-3517-3209		FILE NAME: gmy-psi3.dwg

3.3 LITERATURE SEARCH

The objective of the literature search was to identify all available documents pertaining to past operations at the Aerospace Museum Site and Ground Maintenance Yard. The only written documentation made available, which was associated with the environmental condition of either study site, was an Environmental Baseline Survey for the Aerospace Museum Site (NAS Fort Worth, 1993).

3.4 RECORD KEEPING

This section discusses and describes field and laboratory record keeping.

3.4.1 Field Record Keeping

Field records will be maintained to document field work, sampling events, and personnel at the site. A summary of documents that will be used to record field activities follows.

Field Log Book

A field log book will be maintained during operations at NAS Fort Worth. The log book will be bound, and the pages will be sequentially numbered. The log book will be completed by the site manager, and notes will be kept throughout the day, recording pertinent events and time of occurrence.

Chain-of-Custody Record

Figure 3-3 illustrates the Chain-of-Custody Record form used to transfer custody of the samples from LAW to the shipping agent, and ultimately to the analyzing laboratory. Sample identification names will be recorded on this form prior to shipment. Required signatures will be recorded prior and after receipt of shipment.

CHAIN OF CUSTODY RECORD

4636

SAMPLING INFORMATION

NAME OF FACILITY: _____

STREET ADDRESS: _____

CITY/STATE: _____ ZIP: _____

[illegible]

DISTRIBUTION: ORIGINAL AND PINK COPIES ACCOMPANY SAMPLE SHIPMENT TO LABORATORY
PINK COPY RETAINED BY LABORATORY YELLOW COPY RETAINED BY SAMPLERS

REMARKS:

* SOURCE CODES:

3.4.2 Laboratory Record Keeping

The laboratory will maintain records sufficient to document phases of sample control, from initial receipt of the samples through all stages of analysis and data generation. The laboratory will maintain written procedures for the analytical methods and adhere to strict QA/QC guidelines. Specific laboratory procedures are outlined in the Sampling and Analysis Plan (LAW, 1995a).

3.5 DATA ASSESSMENT

Quality assurance is an important factor in maintaining the integrity of a project in which data collection consumes much of the project time and effort. A structured quality control process to include all stages of the project will be followed as discussed in the AFCEE handbook (AFCEE, 1993) so that the project effort will build on data confidence as the investigation data base expands. The following steps will be followed to maintain this effort:

- A complete and thorough knowledge of the statement of work will be provided to all project personnel.
- Open channels of communication will be maintained between LAW and AFCEE and that communication will be documented.
- Project scoping documents (and all other documents submitted) will be prepared and reviewed for completeness and accuracy.
- Field investigations and laboratory analysis will follow approved procedures outlined in the Work Plan and Sampling and Analysis Plan (LAW, 1995a).
- Field records will be complete and activities will be documented as outlined in the Sampling and Analysis Plan (LAW, 1995a).
- Laboratory methods and QA/QC will be complete, and all activities will be documented as outlined in the Sampling and Analysis Plan (LAW, 1995a).

The field and laboratory data will be reviewed for precision, accuracy, representativeness, comparability, and completeness. Discrepancies in any data set will be noted.

3.6 CHARACTERIZATION OF BACKGROUND CONDITIONS

Background data will be determined from two samples taken in the general vicinity of each of the two sites (Section 3.2.1). These samples will be analyzed for the same parameter as the field samples. These samples will be used for comparison and evaluation for these sites.

3.7 RISK ASSESSMENT

A risk assessment is not required for this initial site characterization.

3.8 BENCH SCALE/TREATABILITY STUDIES

Not used.

3.9 DETAILED ANALYSIS OF ALTERNATIVES

Not used.

4.0 REPORTING REQUIREMENTS

This section defines the project deliverables, describes special notification procedures, and details how variations, if any, will be handled.

4.1 DELIVERABLES

Draft and final scoping documents outlining the project requirements and procedures and the technical report containing the results of the sampling and analysis will be prepared and submitted for review. Other documents, such as interim reports of information or progress, will also be submitted, as required.

4.1.1 Status Reports

Monthly status reports will be prepared to describe the progress of the project. These reports will discuss the following items:

- Identification of installation and activity in progress (man-hour expenditure chart)
- Status of work and progress to date (performance and costs report)
- Percentage completion of the project (performance and costs report)
- Difficulties encountered during the reporting period
- Actions being taken to rectify problems
- Activities planned for the next month
- Changes in personnel

The monthly progress report will include supporting information for hours invoiced for the time period and will identify activities

such as sample collection, analysis of data, report writing, and other items requiring major commitments.

4.1.2 Work Plan

Preparation of the Work Plan for the site investigation/site characterization effort has been based on findings and recommendations in part from past investigations and also from observations of potential environmental concerns at NAS Fort Worth. The Work Plan details recommendations and the decision rationale for conducting field investigations and establishing data quality objectives. The format for this Work Plan was based on the AFCEE handbook (AFCEE, 1993).

4.1.3 Sampling and Analysis Plan

A Sampling and Analysis Plan (SAP) has also been developed as a companion document to the Work Plan. The SAP consists of two parts, the Quality Assurance Project Plan (QAPP) and the Field Sampling Plan (FSP). The QAPP describes the policy, organization, functional activities, and QA/QC procedures which will be implemented in order to achieve the DQOs dictated by the intended use of the data. The FSP provides guidance for all field activities and defines, in detail, the sampling and data gathering methods to be used during the investigation.

4.1.4 Health and Safety Plan Addendum

A site Health and Safety Plan Addendum has been prepared to comply with the OSHA health and safety regulations regarding the work effort detailed in the Work Plan. The Health and Safety Plan uses OSHA guidelines for designating the appropriate level of protection needed at the study sites.

4.1.5 Technical Report

One technical report will be issued at the conclusion of the project. The report will document the Aerospace Museum and Grounds Maintenance Yard site investigations. The report will address the findings of the surface soil (0 to 2 feet) investigation at these two sites and assess the sites for potential areas of contamination which warrant additional investigation. LAW will recommend additional investigation to delineate the extent of contamination, if any, identified during the surface soil sampling event.

4.1.6 Data Management

An Installation Restoration Program Information Management System (IRPIMS) deliverable is not included as part of this statement of work. No other data management deliverable is required by the SOW.

4.2 SPECIAL NOTIFICATION

In the event of an imminent health hazard, LAW site personnel will contact the AFCEE Team Chief and NAS Fort Worth point of contact immediately by telephone. LAW will also submit written notification, along with appropriate supporting documentation, within three days after telephone notification.

4.3 VARIATIONS

If variations in technical efforts, including field work, are necessary, written concurrence from the contracting officer's technical representative will be obtained prior to variation from the agreed upon scope. Under such circumstances, the ceiling price of the order will remain unchanged. Should an increase in the ceiling amount be necessary, the contracting officer's authorization will be required prior to proceeding with the variations.

5.0 PROJECT SCHEDULE

The summary schedule for this project will be prepared, updated and submitted with the respective status reports to show any changes for each of the projected tasks for the Work Plan, field activities, and reports.

6.0 REFERENCES

- AFCEE, 1993. Handbook to Support the Installation Restoration Program (IRP) Statements of Work for Remedial Investigations and Feasibility Studies (RI/FS), September 1993.
- CH2M Hill, 1984. Installation Restoration Program Phase I Records Search for Carswell AFB, CH2M Hill, February 1984.
- ES, 1993. Draft Bioventing Test Work Plan for Petroleum, Oil, and Lubricant Tank Farm Site ST-14, Carswell AFB, Texas, Engineering-Science, Inc., April 1993.
- ES, 1994. Personal communication between Engineering-Science, Inc., and Law Environmental, Inc., October 1994.
- IT, 1994. Personal communication between International Technology Corporation and Law Environmental, Inc., October 1994.
- LAW, 1994a. Installation Restoration Program (IRP) Draft RCRA Facility Investigation Report, Carswell Air Force Base, Fort Worth, Texas, Law Environmental, Inc., December 1994.
- LAW, 1994b. Installation Restoration Program (IRP) Draft Oil/Water Separator Assessment Report, Carswell Air Force Base, Fort Worth, Texas, Law Environmental, Inc., September 1994.
- LAW, 1995a. Installation Restoration Program (IRP) Site Investigation/Site Characterization for Fire Training Area No. 2, Aerospace Museum, and Grounds Maintenance Yard - Draft Sampling and Analysis Plan, Naval Air Station - Fort Worth Joint Reserve Base, Fort Worth, Texas, Law Environmental, Inc., February 1995.

- LAW, 1995b. Installation Restoration Program (IRP) Site Investigation/Site Characterization for Fire Training Area No. 2, Aerospace Museum, and Grounds Maintenance Yard - Draft Health and Safety Plan Addendum, Naval Air Station - Fort Worth Joint Reserve Base, Fort Worth, Texas, Law Environmental, Inc., February 1995.
- LAW, 1995c. Installation Restoration Program (IRP) Base-Wide Quarterly Ground-Water Monitoring - Draft Work Plan, Naval Air Station - Fort Worth Joint Reserve Base, Fort Worth, Texas, Law Environmental, Inc., January 1995.
- Maxim, 1991. Subsurface contamination Assessment Building No. 1337, Maxim Engineers, Inc., April 1990.
- NAS Fort Worth, 1993. Environmental Baseline Survey, Phase I - Southwest Aerospace Museum, Air Force Base Conversion Agency - Carswell Air Force Base, April 23, 1993.
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